COMMERCIAL GROWING OF

SWEET CORN

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CONTENTS

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COMMERCIAL GROWING OF

SWEET CORN

Prepared by the Crops Research Division,
Agricultural Research Service

Commercial growers of sweet corn have two outlets for their product: Processors and the fresh market. Requirements for the growth of high-yielding, high-quality crops for both outlets are practically the same. The crop is grown commercially in more than 30 States.

ADAPTATION

Temperature

Sweet corn is essentially a warm-weather crop. It is easily killed by frost and may be seriously injured by prolonged cool temperatures several degrees above freezing. Germination and emergence of the seedlings are delayed, and may be prevented, by soil tempertures a few degrees below 50° F.

In the United States few varieties can be grown satisfactorily where the midsummer mean temperature is below 65° F. In Canada, however, some extremely small and quick-growing varieties have been developed that can be grown a little farther north than Edmonton, Alberta, where the June-July-August mean temperature is below 60°.

Most of the sweet corn for processing is grown in areas having mean temperatures of 65° to 70° F. for June, July, and August. Most of the acreage is in the eastern half of the country, and if outlined on a map would be north of a line between Indianapolis and Baltimore. Where it is grown in the South or the West, it is planted at such time that it will be exposed to a mean temperature of 65° to 75° through most of the life of the crop.

Rainfall

In nonirrigated areas of the United States sweet corn is grown chiefly where the rainfall from April through September is 20 inches or more and is fairly well distributed, and the annual rainfall is 30 inches or more. Annual rainfall in the extensive sweet corn districts in southern Minnesota is only 25 to 30 inches, but the rainfall from April through September averages 21 to 24 inches.

Unless the soil can retain a large supply of water, sweet corn suffers from lack of moisture if rainless periods last more than 2 weeks. In the so-called dryland farming areas sweet corn is an uncertain crop, and

it either partially or completely fails in 7 or 8 years out of 25.

An average seasonal rainfall of 10 to 12 inches or an annual rainfall of no more than 15 to 20 inches is clearly insufficient for profitable sweet corn crops year after year, even with the use of the best dryland farming methods. Home gardeners in such areas, however, persistently plant sweet corn on the chance that rainfall above normal will occur and result in a good crop.

Day Length

Varieties and hybrids differ in the way their growth is affected by day length. Small early varieties developed for the North generally are not recommended for the South, even for growing during cool seasons. Most such varieties are adapted to the long, cool days of summer in the North; they do not make satisfactory growth during the short days of spring or autumn in the South. Furthermore, the earliest kinds are smaller than desired for shipping from the South.

Certain distinctly southern types such as Honey June and a tropical variety, USDA 34, are adapted to relatively short days as well as to high temperature. When planted in the North they may not silk and tassel until they grow to a height of 8 to 10 feet—then it is too late for them to produce edible corn before frost. They may fail, although it appears the growing season is long enough.

Soils

Sweet corn can be grown successfully on any kind of soil that is well drained (fig. 1) and produces good yields of other crops or a heavy growth of annual weeds. A deep, naturally rich, easily worked soil is preferred, but it is not essential.

Sweet corn is not especially sensitive to soil acidity. If soil is extremely acid, however, add enough lime to make it only moderately acid. Your county agricultural agent will furnish instructions for taking soil samples for lime-requirement tests.

To produce early-market sweet corn, plant on a rather loose, light soil that warms up early in the

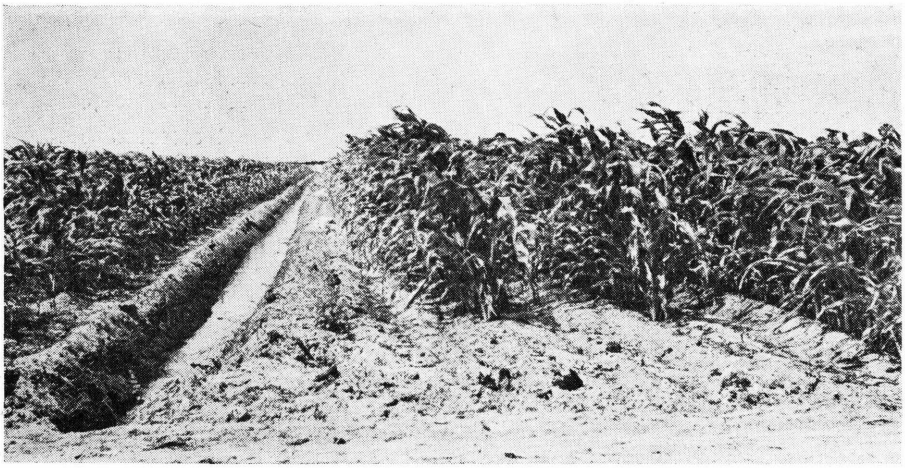

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***Figure 1.*—A good field of Golden Cross Bantam sweet corn on flat sandy land drained by ditches.**

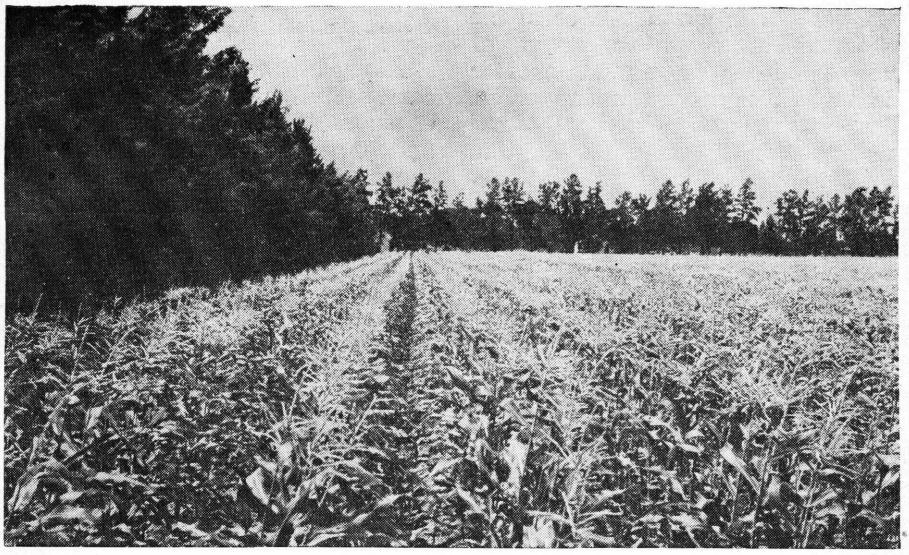

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***Figure 2.*—Sweet corn in a field of light sandy soil protected by a windbreak of single rows of evergreen trees.**

spring. These features are unimportant in the production of crops for later market or for processing, except where the season is short. Soils subject to wind erosion should be protected by windbreaks (fig. 2).

EFFECTS OF TEMPERATURE

Temperature and Growth

Midsummer temperatures in the South and Southwest are often high enough to interfere with pollination. The highest temperatures in those areas usually are accompanied by dry weather, and when heat and dryness occur at the same time pollination is greatly reduced. Hot, dry winds may damage the pollen or the entire tassel so that little or no normal pollen is available to produce a set of seed. Varieties and hybrids differ in their tolerance of heat; some varieties are better adapted to high-temperature conditions than others.

Varietal descriptions usually include a figure that indicates the number of days from planting to harvest. That figure is the approximate number of days required for the variety to reach harvest stage in the area where it is adapted, if normal growing conditions prevail. Development is faster at temperatures above average and is slower at temperatures below average. For example, Golden Bantam is rated as a 78-day variety where it is usually grown, but it may take 90 to 100 days to reach harvest stage if the season is exceptionally cool. The planting-to-harvest period is 90 to 100 days in southern Canada and in other areas where weather is cool during the growing season.

When successive plantings of a single variety are made in the spring, the later plantings develop faster than the early ones because

the weather is warmer later in the season. Therefore, the range of harvest dates will be much shorter than the range of planting dates. For example, Golden Bantam planted April 29 near Washington, D.C., one year reached the best harvest stage in 99 days. Six later plantings at about 8-day intervals reached the same stage in 97, 92, 81, 80, 77, and 75 days. The seventh planting (June 17) reached harvest stage only 26 days later than the first planting, although it was planted 50 days later. Plantings made later than June 17 made part of their growth in cooler weather, and the time required to reach harvest stage increased instead of decreased.

If temperatures either too cool or too hot prevent a planting from reaching harvest stage at about the time typically required, the yield is likely to be impaired.

In warm climates, corn earworm damage is much more serious than in cool climates. In the middle and southern parts of the country, successively later plantings usually suffer increasingly serious damage from the corn earworm. Late plantings often become virtually worthless unless insecticides are used. The development of insecticides and methods of application have played a large part in the expansion of sweet corn culture in the South.

Temperature and Quality

At the best stage for eating, sweet corn kernels contain 5 to 6 percent of sugar, 10 to 11 percent of starch, and 70 percent of water. As the ear continues to mature, sugar content decreases and starch content increases.

Temperature does not have a significant effect on the level of sugar content that develops in kernels, but the maturing process is faster in hot weather. Thus, ears remain in prime condition for eating for a shorter time when weather is hot than they do when weather is cool. In hot weather the ears pass the best eating stage quickly and there is more probability of harvesting ears that are too mature.

This temperature effect on rate of development and maturity is relatively precise and definite. The temperature requirements of specific varieties can be determined from records of plant development and maturity at different field temperatures—plantings at different times and places. From suitable plant, time, and temperature data it is now possible to determine with some accuracy what day a particular field should be harvested to obtain the particular degree of quality desired. Processing companies and other large growers use this method of predicting, a few days in advance, the harvest date to obtain the best quality.

SOIL MANAGEMENT

Prevent erosion by—

- Plowing and planting on the contour if the land is steeply sloping.
- Stripcropping or terracing on slopes steep enough to need such measures.

Publications on specific soil-conserving practices are available from most State agricultural experiment stations and from the U.S. Department of Agriculture, Washington 25, D.C.

Sweet corn fits well into most cropping sequences. It should be grown only once in 3 or 4 years on a particular field. On farms producing livestock or dairy products sweet corn may be grown in rotation with hay, pasture, small grains,

or legumes. Sweet corn should not be planted following sod; wireworm injury to sweet corn is sometimes heavy if it follows sod. On farms where vegetables are grown for processing, sweet corn fits into cropping sequences that include such crops as snap beans, lima beans, peas, tomatoes, pumpkins or squash, cabbage, or potatoes.

Since the best rotation or cropping sequence depends on many factors, it is a problem that must be worked out for each farm.

Ask your county agricultural agent for soil-management recommendations for your locality.

COVER CROPS

It is not possible to give specific instructions for growing cover and green-manure crops; there is too much variation in conditions under which sweet corn is grown. In general—

- If the soil is subject to erosion or leaching, protect it with a cover crop as much of the time as possible—never fail to provide a cover for such soils over winter.
- Grow a green-manure crop for turning under every year or two unless 10 tons or more of manure per acre is applied at similar intervals. (Heavy natural weed cover may help serve the same purpose if plowed down before the weeds go to seed.)

Some usually satisfactory cover or green manure crops for various regions and seasons are:

NORTHERN STATES.—Rye or wheat sown at 1½ to 2 bushels per acre at the last cultivation of sweet corn.

MIDDLE STATES.—Rye or wheat sown at 1½ to 2 bushels per acre in September or October; rye and hairy vetch mixed (1½ bushels of rye and 1 peck of vetch per acre), sown in late August or early September; or crimson clover sown at 20 to 25 pounds per acre from August to October in the States along the Atlantic coast. Crimson clover requires a well-prepared seedbed.

SOUTHERN STATES, AFTER SPRING SWEET CORN.—Cowpeas or soybeans sown at 1½ to 2 bushels per acre.

SOUTHERN STATES, BEFORE SPRING SWEET CORN.—Hairy vetch or smooth vetch sown at 20 to 30 pounds per acre in September; Austrian Winter peas sown at 30 to 40 pounds per acre in September; crimson clover or annual white sweetclover sown at 15 to 20 pounds per acre on well-limed soils in September to November; Southern burclover sown at 50 to 60 pounds in September.

FLORIDA AND DISTRICTS NEAR THE GULF OF MEXICO.—Hairy indigo as a summer legume sown at 6 to 10 pounds per acre in March or April. Lupine as a winter legume sown at 60 to 90 pounds per acre in October or November.

FERTILIZERS

Fertilizer recommendations for sweet corn differ from State to State, and from one soil type to another. Commercial fertilizers, applied either with or without manure, profitably increase yields on most soils. In general, moderate applications of fertilizer supplemented by 10 to 12 tons of manure per acre are more profitable than heavy applications of fertilizer alone or manure alone.

Typical examples of fertilizer recommendations are—

- On the very light, sandy soils of the Atlantic and Gulf Coastal Plains, broadcast 1,000 to 1,200 pounds per acre of 4–8–6 and work it into the soil before planting. Top dress with 150 to 200 pounds per acre of the same fertilizer when the crop is about 8 inches high, and again when it is 15 to 18 inches high. (These high rates are recommended only if little or no manure is available.)
- On soil of average fertility in the Northeast, 600 to 800 pounds per acre of 5–8–5 broadcast and 400 to 500 pounds in band application.
- In the more fertile valleys of the West and Pacific Northwest and on the better soils of the Corn Belt, 5–10–5 applied in bands at planting time at these rates: 300 to 500 pounds per acre if manure has been added, 400 to 700 pounds without manure.

Since stable or barnyard manures contain relatively less phosphorous than nitrogen or potash, manure should be supplemented with the equivalent of about 40 pounds of superphosphate per ton. Supplementing manure with phosphate is especially important if no other fertilizer is used.

Available plant nutrients are especially important early in the life of the corn plant. If sweet corn does not make a rapid, uninterrupted start the yield will be reduced.

Band applications are made with a combination planter and fertilizer distributor that places the fertilizer in bands about 2 inches to the sides of the rows of seed and about an inch deeper than the row of seed.

Broadcast applications of fertilizer are usually put on the soil after plowing and worked in by disking and harrowing. Applications made before plowing or placed on the furrow bottoms during plowing have not given results as good as the more conventional applications.

SOIL PREPARATION

For top yields and profits, you must have a full stand of plants that mature uniformly. Proper seedbed preparation enables the plants to make the kind of start that is necessary for a full, uniform stand at harvest.

Prepare a seedbed that is deep and firm, and free of clods, trash, and surface irregularities. Only in such a seedbed can seed and fertilizer be precisely placed so that germination and emergence will be uniform.

Moderately heavy to heavy soils that are not subject to erosion may be plowed in the fall and left rough over winter; such soils can be worked and planted earlier in the spring if they are plowed in the fall. Light soils that are subject to leaching and all soils subject to erosion should be kept covered over winter and plowed in early spring.

Stubble or cover or green-manure crops that precede sweet corn should be plowed under deeply and the soil disked 3 or 4 weeks before planting. This allows time for partial decomposition of the material so it will not interfere with final soil preparation or with operation of the planter. Disk and harrow as many times as necessary to prepare a uniform seedbed and to keep weeds under control.

If your farm is in an irrigation district, follow recommendations for your district for final preparation before planting.

PLANTING

Time of Planting

Plant sweet corn after the soil has become warm and there is little or no danger of frost. In general, crops for processing and for the main market may be planted 10 days to 2 weeks after the average date of the last killing frost.

Market gardeners who strive for the earliest market plant part of their acreage only a few days to a week after the average date of the last killing frost if the weather appears favorable. Low temperatures this early in the season may cause poor germination, retarded growth, and loss of seedlings. However, early planting is usually worth the risk—if warm weather continues, the crop may be marketed several days before heavy marketing begins. If cool weather does cause injury, another planting can be made promptly.

Two methods are used to extend the length of the harvest period:

- Making successive plantings at intervals of a week or less.
- Planting early, medium, and late varieties at one time.

In the South the best adapted varieties do not differ greatly in the time required to reach maturity, so successive plantings are the best way to extend the harvest season.

In the middle part of the country, either method may be used.

In the northerly States the simultaneous planting of early, medium, and late varieties is preferred. In the North, the season is not long enough to permit a wide range of dates for planting late varieties. Late plantings of early varieties are less productive than earlier plantings of later varieties.

Rates and Systems of Planting

Planting seed singly in drills is generally preferred to the check-row system of planting three or four seeds in hills. With the effective machines and herbicides now available for weed control, there is less need for cross cultivation than there was before present machines and herbicides were developed.

In few districts are 10,000 to 12,000 plants per acre considered enough for the most profitable production. Recommended planting rates are as high as 16,000 to 17,000 plants per acre of medium-sized varieties such as Golden Cross Bantam, and 20,000 or more plants of the small, early varieties. These rates require about 12 to 14 pounds of seed per acre.

Suggested spacings for drilled corn are listed below. The first figure refers to the distance between rows, and the second figure to distance between single plants in the row. See pages 16 and 17 for information on plant sizes.

For very small, very early varieties: 30 by 8, or 30 by 9 inches.

For small, early varieties: 30 by 10, 32 by 10, or 32 by 12 inches.

For medium-sized varieties: 32 by 12, 32 by 14, or 36 by 12 inches.

For large varieties: 36 by 14 or 40 by 12 inches.

For very large, late varieties: 42 by 12 or 42 by 14 inches.

For hills in check rows three or four plants per hill are best, with the hills about 32 by 32 inches for small varieties, 36 by 36 for medium varieties, and 40 by 40 for large varieties.

Seed Size and Planter Plates

To plant precisely the quantity of seed you desire you must have—

- A dependable planter, with plates designed for the desired rates of planting.
- Seed that has been "sized," or graded for size.

No planter can drop ungraded seed uniformly, because a planter

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plate with holes of a particular size will deliver more small seeds than large ones. Bags of graded seed are marked with the size of planter plate to be used with the seed. The correct planter plates must be used for each size of seed.

If you make only a small planting of market corn, probably it will not matter whether you plant sized seed. But it is very important to use sized seed, and planter plates of the size designated for the seed, if you have large plantings that are to be harvested on schedule.

Depth of Planting

Planting too deep is a common error; seed should be planted only deep enough to place it in moist soil below the dry surface layer. In loamy, silty, or other heavy soils the depth should be not more than 1 inch, although the soil at that depth may appear somewhat dry at planting time. More than 1 inch of soil over the seed may interfere with germination and emergence if hard rains pack or crust the soil before emergence. In sandy loams 1½ inches is a good planting depth. In very light or sandy soils that dry out quickly and are not packed by rains, the seed should be placed about 2 inches deep. Seedlings can push through 2 to 2½ inches of very light soils without harm.

Replanting

Plants that start growth late rarely, if ever, catch up with plants that start early. The larger plants tend to crowd the laggards, which may produce nothing. For this reason replanting the "skips" or missing hills by hand after the sweet corn is up and growing is not recommended.

Trying to "patch up" a poor stand usually is futile. If a stand is very poor, it is usually better to replant entirely.

INTERDEPENDENCE OF—

- FERTILIZING
- PLANTING RATE
- AVAILABLE MOISTURE

The most profitable sweet corn crops are produced when there is a high population of plants that have all the nutrients and moisture they can use. For highest profits, there must be a balance of these three elements.

If you plant at maximum rates, apply the maximum amounts of fertilizer shown on page 6.

Don't apply fertilizer at a maximum rate if the planting rate is moderate.

Decide on both planting rate and fertilizing rate in view of the moisture supply that is likely to be available.

IRRIGATING

Humid Areas

In the humid eastern half of the country there is usually enough moisture for sweet corn to make normal growth up to the silking stage. After that time rainless periods in about half of the years are likely to be long enough to interfere with growth on light soils of low moisture-holding capacity.

Even in areas where the average annual rainfall is from 35 to 50 inches and the warm-season rainfall is from 21 to 30 inches, growers are finding that supplemental irrigation of market sweet corn is profitable. This is true especially in sections of the Atlantic and Gulf Coastal Plains that have soils with a low water-holding capacity. On such light soils, sweet corn should

receive the equivalent of about an acre-inch of water every week, either as rainfall or irrigation.

Yield increases in irrigated corn are greater on soils well supplied with organic matter. The percentage of marketable ears also is higher on soils well supplied with organic matter.

Supplemental irrigation appears profitable for market sweet corn on the heavier soils in areas where rainless periods of 2 weeks or more are likely to occur.

Prices normally received for corn for processing will hardly justify the cost of sprinkling equipment in the so-called humid areas having reasonably well distributed rainfall.

Since irrigation is not needed every year in the Eastern States, a permanent irrigation system will hardly be justified for growing sweet corn. Portable sprinkler systems that can be moved from field to field, however, appear profitable. Of course, a cheap and dependable supply of water must be available close to the field. Many factors must be taken into account in determining whether irrigation is likely to be profitable.

Irrigated Districts

Sweet corn acreage is increasing in the irrigated districts of the West. It produces very high yields under good management in favorable locations. Irrigation practices may differ widely from one district to another. No effort, therefore, is made here to outline details of the methods used in various places.

Regardless of the surface methods used, it is generally recommended that at each irrigation small streams be run in the furrows until the water soaks down to a depth of 1½ to 2 feet. A few thorough soakings are preferred to frequent light applications.

FIELD CARE OF THE CROP

Suckering

The removal of suckers, or tillers, from sweet corn plants is, at best, a waste of labor. In the Eastern States delayed suckering actually reduces yields; the later the removal—up through tasseling time—the more serious the reduction in yield. Experiments in the West have shown no such harmful results, but they have shown that suckering is an unprofitable practice.

Cultivating

The most important reason for cultivating is to kill weeds. But cultivating when few weeds are present may be beneficial if fine-textured, poorly granulated soil becomes compacted or sealed at the surface. Breaking the crust will permit better water intake and better aeration, and may aid emergence of the crop seedlings.

Weeds are easiest to kill by cultivation when they are small; the longer a cultivation is delayed in a weed-infested field, the less effective it will be.

Usually there is no advantage in cultivating sweet corn after it is 18 to 24 inches tall if weeds have been kept under control by earlier cultivations and if stands are adequate to provide uniform shade.

Soils easy to work

If the soil is mellow and easy to work, use a spike-tooth harrow, a spring-tooth weeder, or a rotary hoe for early cultivations (up to the five-leaf stage of growth). These implements are wide and light. They can be pulled rapidly, and have little compacting effect.

The rotary hoe is especially useful for breaking crust on the soil surface to aid emergence of crop seedlings. For weed control, the implement is most effective if used when the seedling weeds have emerged and the soil has a dry crust. Rotary hoeing under these conditions exposes the weed roots to drying, which kills the weeds.

The spike-tooth harrow, the spring-tooth weeder, and the rotary hoe can be set to work near the surface. When set for shallow cultivating, they do not bring the deeply buried seeds up near the surface, where they can germinate. These implements have little effect on well-established perennial weeds, or on annuals such as the cocklebur that germinate well below the soil surface. Between the five-leaf stage of growth and the time when the crop becomes 18 to 24 inches high, use a shovel cultivator as often as necessary to keep down weed growth.

Soils difficult to work

If a cultivation is necessary between planting and the emergence of crop seedlings in soils difficult to work, use one of the three implements recommended for easily worked soils. Use a shovel cultivator for all other cultivations in soils that are difficult to work.

Make the first postemergence cultivation before corn reaches the five-leaf stage of growth. Use a shield on the cultivator to prevent burying the small plants, and travel at a slow speed.

Make the later cultivations (up to the time corn becomes 18 to 24 inches high) as frequently as necessary for good weed control.

Cultivate just deep enough for weed control. Gouging down as deep as 4 inches damages sweet corn roots after the plants are past the seedling stage. Furthermore, the crop does not benefit from a higher ridge of soil in the row—the ridge need only be high enough to cover the weeds.

The "duck foot" cultivator sweep, which runs nearly flat under the surface, is the most generally useful type of shovel. Such sweeps cannot be kept in hard soil, however, except with heavy tractor cultivators. Pairs of disks (disk hillers), one on each side of the sweet corn row, in combination with sweeps are highly effective for late cultivations, for controlling vine weeds, and for cultivating trashy soil.

Flame Weeding

Flame weeding is not recommended for sweet corn because it may injure the crop.

Chemical Weed Control

Herbicide applications can greatly aid in controlling weeds. Chemical weed control should not be expected to replace cultivation entirely—weeds that are not controlled by herbicides may rapidly infest fields that are sprayed but not cultivated.

Herbicide applications may be made before the sweet corn emerges, after it has emerged, and at lay-by. These are known, respectively, as preemergence, overall postemergence, and directed postemergence treatments. DNBP or 2,4-D may be used for the preemergence treatment; 2,4-D is the only herbicide approved for postemergence treatments.

The preemergence and both kinds of postemergence treatments are sometimes used for season-long control. In such cases, the first spray controls annual grasses and broad-leaved weeds for 5 to 7 weeks, and the two later sprays control the broad-leaved weeds that germinate after the herbicide of the first application has dissipated.

Preemergence spray

Preemergence sprays of 2,4-D are usually applied at rates of 1 to 2 pounds of acid equivalent per acre. At this rate they are effective against annual grasses and some broad-leaved weeds that are not controlled with postemergence sprays. Preemergence spraying can be done any time between planting and the time when corn emerges from the soil. The low-volatile esters of 2,4-D, rather than the amine salt formulations, are recommended for preemergence spraying.

Preemergence treatments are effective in most areas and on most soil types. They are especially useful on river bottom soils having heavy weed infestations. Preemergence sprays of 2,4-D should not, however, be used on sandy loams or lighter soils. There is danger that the 2,4-D will penetrate too deeply and injure the germinating sweet corn on such soils. Soils high in organic matter require higher rates of application than those low in organic matter. Dry weather after preemergence treatments decreases their effectiveness; adequate soil moisture increases their effectiveness.

Preemergence sprays of DNBP at 4 to 8 pounds per acre are effective in controlling broad-leaved weeds and weedy grasses when soil moisture is high enough for rapid weed seed germination. These treatments are effective for 4 to 6 weeks after application. Do not use DNBP after emergence.

Overall postemergence spray

The first postemergence spray is called "overall" or "broadcast" spray because nozzles are adjusted so all the foliage—on both sweet corn and weeds—is covered.

Make the overall postemergence application when the crop is 6 to 10 inches tall. Apply an ester formulation of 2,4-D at a rate of one-fourth pound per acre or an amine salt formulation at a rate of one-half pound per acre.

As the corn grows taller the chances of injury from overall sprays increase. Brittleness and some distortion of plant form may be expected after treatment of corn that is several inches high. Cultivation should therefore be delayed for 5 to 10 days after a postemergence spraying. Corn hybrids vary in their degree of susceptibility to 2,4-D, but the differences are not usually noticeable if applications are at recommended rates.

Directed postemergence spray

Weed growth after the last cultivation (lay-by) can be prevented or made less troublesome by applying 2,4-D. The best time for this application is immediately after lay-by, although it may be made later.

The application following lay-by is called a directed spray because the nozzles are arranged and calibrated to apply the 2,4-D in a specific pattern—

- One-fourth pound per acre to the bases of cornstalks and to weeds in the row.
- Three-fourths pound per acre to the soil between the rows.

Procedures and precautions

Chemical control of weeds in sweet corn requires a thorough knowledge of spraying procedures. Equipment should be carefully adjusted and in good operating condition. Extreme care is necessary to—

- Calibrate nozzles to deliver the proper size of spray droplet.
- Adjust nozzles to proper height.
- Maintain tractor speed so that the equipment delivers spray at correct rates.

Carefully follow the manufacturer's recommendations on the label in using all herbicides. Treatments at times other than those recommended, or applying at rates in ex-

cess of the recommended amounts, may cause injury to the crop or leave harmful residues in or on the marketed product. Avoid damage to nearby susceptible crops from drifting spray by careful observance of precautions stated on the label.

HARVESTING

Harvest when the kernels are in the milk stage. At this stage the silks are brown and dry beyond the end of the husks and the kernels have developed enough size for the ear to fill the husks snugly well out toward the tip. The husks feel tightly fitted about the ear. The kernels are almost as large as they will become, but they are still soft and tender, and are filled with a thick, opaque, milky juice.

If the ears are harvested when the kernels are filled with a thin and watery or only cloudy or translucent liquid, the edible portion per ear will be low and it will lack the desired rich body and flavor. If harvest is delayed until the kernel contents become semisolid or doughlike, most of the sweetness will be gone and the skins, or coats, of the kernels will be tough.

Fortunately, the best quality occurs at the time when the largest yield of fresh kernels is obtainable. Delaying harvest beyond the best stage will not give any worthwhile increase in weight of edible corn. Beyond that stage the kernels and entire ear begin to lose water about as fast as solid matter develops, and loss of eating quality is rapid.

Predicting Maturity

As indicated on page 4, some processing companies use rather elaborate instruments and calculations to take as much of the guesswork as possible out of the problem of judging the best harvest stage. Such methods are especially useful in scheduling extensive operations and in harvesting a product that must meet rather strict standards of uniformity and composition.

Judging Maturity

Although high quality is no less desirable in market sweet corn than in processed sweet corn, minor variations in stage of development of ears for market are less noticeable and less objectionable than they are in processed products.

Market sweet corn, therefore, is commonly harvested only on the basis of exterior appearance and "feel." In learning to judge proper maturity on this basis, it will be helpful to husk several ears, to push the thumbnail into a few kernels and examine their contents.

With some experience, you will learn to distinguish on sight most ears that are ready for harvest. When you grasp the ear to break it from the stalk, the "feel" of immaturity will reveal some ears that are not quite ready for harvest, although, at a glance, they appear ready.

Do not pull husks away from the kernels of ears that are to be marketed in the husk. Ears should not be "explored" in this way and left on the plant for later harvest; exposure subjects kernels to injury and lowers their quality.

METHODS OF HARVESTING

Whether harvesting is done by hand or by machine, do as much of the harvesting as possible in the early morning while both the ears and the air are cool. High temperatures quickly lower the eating qual-

ity of sweet corn. Never leave harvested ears in piles or on vehicles where they will become heated.

Hand Harvesting

In hand harvesting break the shank, or stem of the ear, as close to the ear as practicable without breaking the main stalk or tearing the entire shank from the stalk. Grasp the ear near its base and bend it sharply downward or to one side with a rotary motion of the wrist. At first it may be necessary to hold the stalk or the shank with one hand to break ears off properly. With practice, you will be able to snap the ears of most varieties off properly and easily with one hand.

In small-scale operations the hand pickers drop the ears into bags or other containers that they carry to the ends of the rows and empty into other containers or into the bed of a vehicle. In large-scale operations in which a highly uniform field is harvested only one time, the ears are thrown directly into a vehicle that is driven alongside the pickers (fig. 3).

Sweet corn for processing is usually picked and loaded directly into the vehicle in which it is delivered to the factory. Corn for market is usually hauled to a central point on the farm or to a packinghouse, where it is prepared for market (figs. 4 and 5).

In the Everglades of Florida mobile "packinghouses" move through some fields; hand pickers put the corn on conveyors that carry it to workers who trim and pack the ears into crates. The crates are then moved by other conveyors onto trucks (fig. 6).

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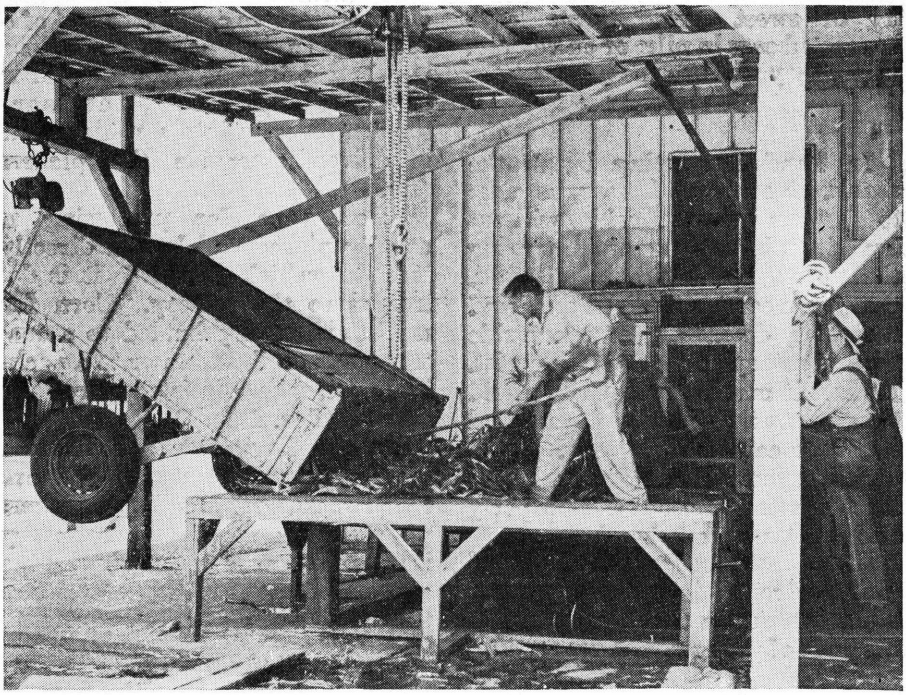
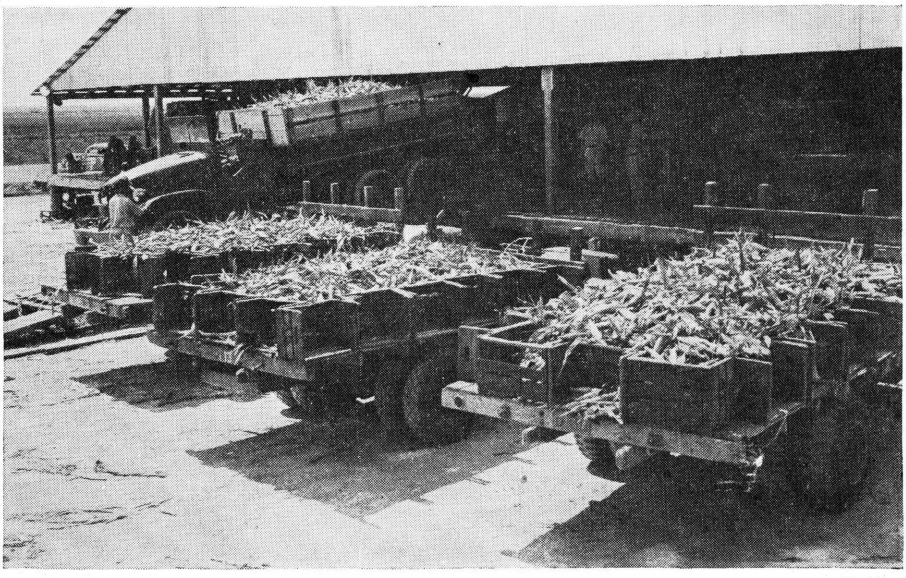
***Figure 3.*—Hand harvesting sweet corn. Ears from six rows are tossed into the tractor-trailer, which delivers them to a central packinghouse.**



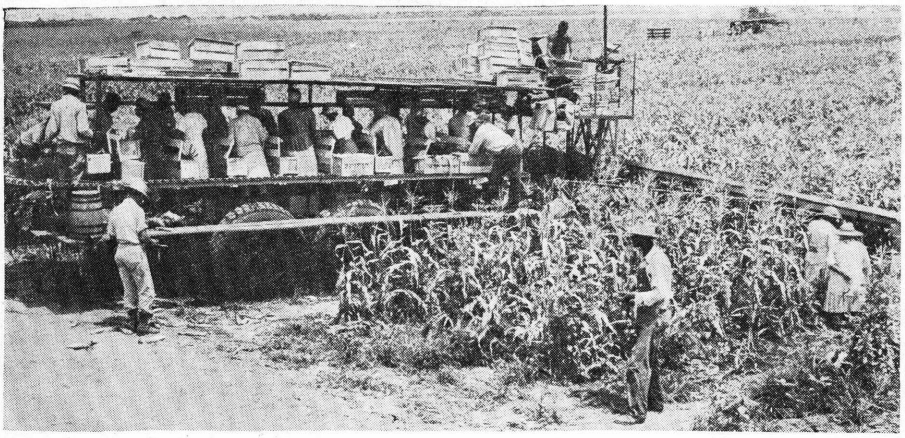
G–45

Figure 4.—A chain hoist lifts the end of the trailer to speed unloading of sweet corn at the packinghouse immediately after picking.



T–42

Figure 5.—Sweet corn hauled by truck to the packinghouse. Spaces for ventilation between compartments retard rise in temperature of corn that cannot be unloaded and cooled immediately.



T–73

Figure 6.—**A mobile "packinghouse," or harvester, reentering a field after making a turn.**

Machine Harvesting

Since sweet corn grown under contract for the canner or freezer is harvested and handled under the direction of company fieldmen, there is no point in going into detail here. It is noteworthy, however, that the mechanical sweet corn harvester is being improved each year and is being used increasingly. Probably more than half the crop for processing is machine harvested.

One advantage of the mechanical harvester is that it can be operated at night. It can thus take advantage of cooler temperatures.

One skilled operator with a tractor-picker-trailer combination can harvest 50 to 60 tons in a 10-hour day—one man can harvest 2½ to 4 tons a day by hand. Some machines under good conditions in good fields have picked up to 9 tons an hour—as much as 15 to 20 men normally pick in an hour.

Although the machine picks culls that must be thrown out at the factory, it does not miss many good ears, as hand pickers sometimes do.

Mechanical pickers cause some ear damage, but for processing it is not serious economically in view of the saving in labor costs. Precise planting and uniform growth of a uniformly maturing stock are essential for successful use of mechanical pickers. A field can be picked by machine only once because the machine mangles or cuts up the plants.

HANDLING HARVESTED CROP

At 86° F., about half the sugar in the kernels is lost within 24 hours after harvest. Sugar losses are greater at higher temperatures and less at lower temperatures.

Not all of the sugar that is lost goes to form starch or other substances in the kernel. Much of it is lost by respiration. Respiration releases carbon dioxide, water, and heat. When corn is thrown into large piles or tightly packed without adequate cooling, the heat of respiration raises the temperature of the corn. The higher temperature speeds up respiration, which raises the temperature still more. Under these conditions, temperature will become high enough in a few hours to ruin the corn.

Sweet corn for processing normally is delivered to the factory

within a few hours after it is harvested; therefore, it is given no special treatment or handling. In hot weather, loss of quality in harvested corn is likely if it is not quickly delivered to the processors. This effect of temperature is one of the reasons the northern part of the country is more favorable for processing high-quality sweet corn than is the southern part.

If market corn can be harvested at the break of day, kept out of the sun, and rushed to the consumer before noon, no icing or refrigeration is usually necessary. If the corn is to be held more than a few hours before use, however, effective cooling of the ears immediately after harvest is essential. A variety of cooling methods is used to retard loss of quality.

For information on handling market corn, consult your State agricultural experiment station or write to the Agricultural Marketing Service, Beltsville, Md.

VARIETIES

Superior hybrids have largely replaced open-pollinated varieties. Except for late-maturing varieties, nearly all the leading varieties and hybrids have yellow kernels.

Varietal Descriptions

Many public research agencies and private companies are breeding and introducing new sweet corns. As a result a large number of hybrids and varieties is now grown. Many hybrids and varieties are available for only a few years because they are displaced by better ones.

Hybrids of commercial origin bear different names or identifying numbers, although some of them may be similar and have the same unidentified parents. Among certain hybrids or varieties having different names there are sometimes no greater differences in appearance or performance than there are among stocks having the same name. And a single variety or hybrid may develop and behave very differently in different places.

Because of the rapidity with which sweet corn seed stocks are being changed, it is not practicable to give descriptions that will permit sure identification of even all the important ones. Therefore, only a few of the more obvious and important features will be listed for a number of varieties and hybrids that have appeared outstanding in one district or another (table 1).

TABLE 1.—*Some of the principal features of some sweet corn hybrids and varieties commonly grown in the United States*

SMALL TO VERY SMALL VERY EARLY KINDS, 65 TO 74 DAYS TO HARVEST [1]

Variety or hybrid	Kernel color [2]	Time to harvest	Ear length	Rows of kernels	Plant height
		Days	*Inches*	*Number*	*Feet*
Earligold	Y	73	7	12	6
Early Surprise [3]	Y	72	7	8–12	5
Golden Early Market [3]	Y	73	6½	8–12	4½
Golden Midget [3]	Y	70	4	8	3
Golden Rocket	Y	67	7	10–12	5
Golden Sunshine [3]	Y	74	6½	10–12	5½
Marcross	Y	74	7½	10–14	5½
North Star	Y	70	6½	8–12	5½
Seneca Dawn	Y	70	7½	12–16	5
Seneca Golden	Y	72	7	12	5½
Seneca 60	Y	67	6½	10–12	4½
Spancross	Y	70	6½	10–12	5½

See footnotes at end of table.

TABLE 1.—*Some of the principal features of some sweet corn hybrids and varieties commonly grown in the United States*—Continued

SMALL EARLY KINDS, 75 TO 80 DAYS TO HARVEST [1]

Variety or hybrid	Kernel color [2]	Time to harvest	Ear length	Rows of kernels	Plant height
		Days	*Inches*	*Number*	*Feet*
Carmelcross	Y	77	7	12–14	5½
FM Cross	Y	80	7	14–16	6
Golden Bantam [3]	Y	78	6½	8	5½
Gold Rush	Y	77	7	12–14	6
Midgolden	Y	78	7½	10–14	6
Northern Cross	Y	77	7	10–14	6½
Tendergold	Y	80	7½	10–14	6
MEDIUM TO LARGE MIDSEASON KINDS, 81 TO 89 DAYS TO HARVEST [1]					
Aristogold Bantam Evergreen	Y	87	9½	16–18	7
Calumet	Y	86	9	12–14	7
Erie	Y	88	9	12–14	6½
Golden Bounty	Y	83	9	12–14	7½
Golden Cross Bantam	Y	85	8	10–14	6
Golden Hybrid 2439	Y	87	7½	12–16	7
Golden Security	Y	85	8	14–16	7½
Huron	Y	89	9	12–16	7
Illinois Golden Hybrid No. 10	Y	86	7½	12–14	6½
Ioana	Y	87	8	12–14	6½
Kennebec	Y	82	7½	12–14	6
Lee	Y	84	7½	12–16	6½
Lincoln	Y	83	7½	12–16	6
Oto	Y	87	9	8–12	7
Seneca Chief	Y	85	9	12	6½
Top Cross Maine Bantam	Y	83	7½	12–16	6
Seneca Wampum	Y	89	8	14–16	7½
LARGE LATE KINDS, 90 DAYS OR OVER TO HARVEST [1]					
Country Gentleman [3]	W	95	7	(4)	7
Country Gentleman 8 x 6	W	95	8	(4)	7
Country Gentleman (Ill.) No. 13	W	97	7½	(4)	7½
Honey June [3]	W	105	8	12–18	9
Iochief	Y	90	9	14–18	7
Iogent No. 11	W	98	8	(4)	8
Iogreen	W	95	7½	20–26	8
Narrow Grain hybrid	W	95	8	(4)	8
Stowell Evergreen [3]	W	95	8	16–20	8½
Stowell Evergreen hybrid 14 x 13	W	96	8	14–18	8

[1] Days to harvest are the approximate number of days from planting to harvest when planted about the frost-free date in a region or season having a monthly mean temperature of 70° to 75° F. during most of the growing season. Mean growing season temperatures as low as 65° will increase the time to harvest by about 15 to 20 days for most varieties.

[2] Y indicates yellow kernels; W, white.

[3] Open-pollinated variety.

[4] Nonrowed variety.

Regional Recommendations

Variety tests of sweet corn are conducted on a rather large scale every year in many States. Lists of recommended varieties change almost annually, as new varieties appear and as experience with them indicates changes should be made. Table 2 indicates which of the varieties listed in table 1 appear best for growing for market in different sections of the country. The information in table 2 is based, chiefly, on tests conducted by State agricultural experiment stations.

The climate in some of the northernmost sections and in the Pacific Northwest is so cool that all varieties develop more slowly than in most other places where sweet corn is generally grown. For example, in the Upper Peninsula of Michigan nothing later than Golden Bantam can be grown. Rated as a 78-day variety under average conditions, Golden Bantam requires about 100 days in that section. Later varieties encounter frost before harvesttime.

In western Washington Carmelcross requires 100 to 120 days, al-

TABLE 2.—*Some sweet corn varieties recommended for growing for market in several areas of the United States, 1960*

[The later varieties adapted to an area are generally preferred because they are more productive than equally adapted early varieties]

Area	Some varieties recommended
Extreme Southeast	Golden Cross Bantam, Calumet, Ioana, Aristogold Bantam Evergreen, Illinois Golden Hybrid No. 10,[1] Golden Security, Erie.
Middle South	Aristogold Bantam Evergreen, Calumet, Golden Cross Bantam, Ioana, Golden Security, Golden Hybrid 2439, Illinois Golden Hybrid No. 10, Erie.
Texas	Calumet, Ioana, Aristogold Bantam Evergreen, Golden Cross Bantam.
Middle Atlantic	Calumet, Carmelcross, Aristogold Bantam Evergreen, Golden Cross Bantam, Ioana, Iochief, Golden Security, Stowell Evergreen hybrid, Country Gentleman, and Country Gentleman hybrids.
Northeast [2] [3]	Marcross, Calumet, Carmelcross, North Star, Northern Cross, Golden Rocket, Golden Cross Bantam, Ioana, Seneca Chief.[4]
Corn Belt [3]	Same as for northeast area.
North Central [5]	Spancross, Marcross, Carmelcross, Golden Rocket, Gold Rush, Golden Cross Bantam, Ioana.
Northernmost Central and Northeast.	Only small, early, varieties are suitable. Nothing later than Golden Bantam (*not* Golden Cross Bantam) is recommended. See table 1. Note: All varieties are 2 to 3 weeks later than in warmer parts of the country.
Western "Intermountain." [5]	Marcross, Carmelcross, Seneca Golden, Golden Cross Bantam, Ioana, Illinois Golden Hybrid No. 10.
California	Golden Cross Bantam, Ioana, Seneca Chief,[4] Marcross, Carmelcross.
Pacific Northwest	Spancross, Golden Rocket, North Star, Carmelcross, Seneca Chief,[4] Golden Cross Bantam, FM Cross. Note: All varieties 2 to 3 weeks later than in warmer parts of the country.

[1] Especially in the Everglades.
[2] Varieties for West Virginia are in this group rather than in the Middle Atlantic group.
[3] The earlier varieties shown are better adapted for the cooler districts of the area.
[4] Chiefly for home use and local market.
[5] The later varieties are adapted to the warmer parts of the area.

though it is rated as a 77-day variety; Golden Cross Bantam may require up to 130 days in some localities of the section. Such effects of climate should be kept in mind in using table 1 and table 2.

DISEASES

Root rots cause great losses in sweet corn; losses are especially heavy in field-corn regions. Infection of a crop may be caused by diseased seed or by rot-producing fungi in the soil. These diseases cause reduced yields, irregular growth and maturity, barren stalks or stalks that bear nubbin ears, or premature death.

All seed should be treated for protection against root rot diseases before planting. If it is not treated by the producer or dealer, treat it at home. Recommendations for seed treatment are given in USDA Miscellaneous Publication 219, "Treat Seed Grain."

Rotating crops and keeping soil in a highly fertile condition will keep damage down to some extent if the soil becomes infested.

Smut is a widely distributed disease. It attacks the stalks, ears, and tassels. The fungus that causes it produces irregular galls, or outgrowths, that are covered at first with a white membrane. Later, these membranes break open and masses of black spores are scattered. The smut fungus will infect at any actively growing point or fresh wound on the plant at any period during the growth of the crop. Treatment of the seed to prevent smut is ineffective. Crop rotations help reduce infections. Manure or refuse matter produced from feeding smut-infested corn stover to livestock may contain disease organisms; do not feed such material on land that will be used for sweet corn. Do not plow smutted plants into the ground; remove and burn them.

Ear rots are caused by several fungi. Infected ears develop imperfectly and are soft and often have a moldy appearance. The ear rots, which usually appear late in the season, are important chiefly where sweet corn is grown for seed. They are most serious in moist, warm weather. Control measures include rotation, clean cultivation, and the use of disease-free seed of disease-resistant strains.

Bacteral wilt, or Stewarts disease, of sweet corn occurs to some extent every year in the Middle Atlantic States. After a series of mild winters the disease occasionally causes serious losses.

The bacteria that cause the disease live over winter in one of the corn flea beetles and are carried to the young corn plants upon which the beetles feed. Throughout the season the beetles spread the disease by carrying the bacteria from diseased to healthy plants.

Long, wilted, pale-green streaks first develop in the leaves. The streaks turn yellow and leaf tissue in the center of the streaks dies. Bacteria fill the water-conducting vessels and spread into the stalk. When the stalk is cut crosswise small droplets of yellow bacteria ooze out as yellow beads on the cut ends. Plants may wilt and die. Or they may remain stunted, develop premature tassels, and bear nubbins or no ears at all.

Golden Bantam and certain other early varieties are most susceptible. The development and use of resistant hybrids and strains has reduced losses. Resistant hybrids and strains include Golden Cross Bantam, Marcross, Carmelcross, Spancross, and Ioana.

The two LEAF BLIGHTS caused by *Helminthosporium turcicum* and *H. maydis* are sometimes severe in certain sections. No highly resistant varieties are known but tolerance to one or the other of the blights has been reported in a few hybrids including Gold Rush and Asgrow Golden 60. Breeders are seeking high resistance. Sanitation and rotation along with a spray schedule using zineb or nabam plus zinc sulfate control the disease.

The time to start spraying and frequency of spraying depend upon local weather conditions and prevalence of the diseases. If the weather is very rainy or humid and the blights are serious, spraying may need to start when the plants are only 2 to 3 inches tall and be repeated as often as every 3 to 5 days until 10 days before harvest. In less rainy and humid weather good control can be obtained by spraying at 5- to 7-day intervals, starting when the plants are 4 to 6 inches tall. These expensive control measures are feasible only for sweet corn that can be sold at relatively high prices (for example, the winter crops in the South that are shipped north).

Dusts are less effective than sprays and are recommended only if the infection is light. Dusts may be used temporarily on heavy infections, until sprays can be applied.

Because of differences in the prevalance of these blights in different districts and in the control measures required, no general directions for their profitable control can be given.

For detailed information concerning these or other diseases, write to your State agricultural experiment station or to the U.S. Department of Agriculture, Washington 25, D.C.

INSECTS [1]

Many species of insects attack and damage sweet corn. Among the more important ones are the corn earworm, the European corn borer, common cornstalk borers, webworms, the armyworm, cutworms, the fall armyworm, the chinch bug, the corn flea beetle, the corn leaf aphid, sap beetles, the corn root aphid, white grubs, the Japanese beetle, leafhoppers, grasshoppers, wireworms, the seed-corn maggot, and the southern corn rootworm.

Spraying with DDT or Sevin gives protection against the earworm.

To prepare the spray containing DDT, mix 1 gallon of 25-percent DDT emulsifiable concentrate with enough water to make 25 gallons of emulsion. Use a high-clearance sprayer (fig. 7) having four nozzles per row. Direct spray to the ear zone. Twenty-five gallons is enough for 1 acre of corn.

Spray containing Sevin is applied in the same manner as the DDT spray. Use 3 pounds of 50-percent Sevin wettable powder or 1¾ pounds of 85-percent Sevin sprayable in 25 gallons of water.

For best control of the earworm with either DDT or Sevin, make at least five applications at 1- to 3-day intervals, beginning the day after silks appear.

Control the European corn borer with emulsion sprays, dusts, or granules containing DDT, with ryania dust, or with toxaphene granules. For information on dosages and timing of the applications, and for information on control of other insects that infest sweet corn, consult your county agricultural agent or your State agricultural experiment station, or write to the U.S. Department of Agriculture, Washington 25, D.C.

[1] Prepared by Entomology Research Division.

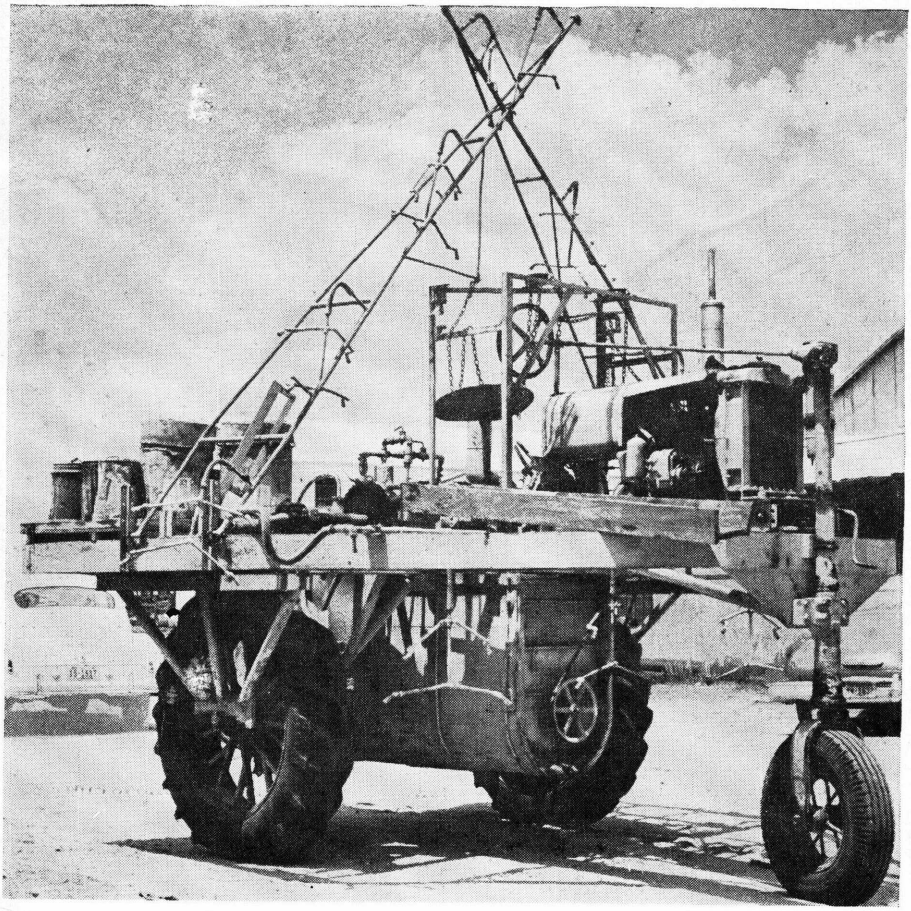


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Figure 7.—A high-clearance sprayer for insect control in sweet corn. The spray booms are raised to permit driving the machine to the field.

PRECAUTIONS

Insecticides are poisonous. Use them only when needed and handle them with care. Follow the directions and heed all precautions on the container label. Insecticides should be kept in closed, well-labeled containers in a dry place where they will not contaminate food or feed, and where children and pets cannot reach them.

To minimize losses of honey bees, make insecticide applications, when possible, during hours when bees are not visiting the plants.

To protect fish and wildlife, do not contaminate streams, lakes or ponds with insecticides. Do not clean spraying equipment or dump excess spray material near such water.

Do not feed stover treated with DDT to livestock.

If fodder or forage sprayed with Sevin is to be consumed by livestock, wait at least 7 days after application before harvesting or feeding. No waiting period is necessary if the crop is to be harvested only for human consumption—residues do not accumulate in the kernels in harmful amounts.

Do not feed ensilage from plants treated with toxaphene to dairy animals or animals being finished for slaughter. Do not allow dairy animals to feed upon stover treated with toxaphene. Take meat animals from toxaphene-treated stover at least 4 weeks before slaughter.

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